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AMENDMENTS TO THE CLAIMS

The listing of claims will replace all prior versions and listings in the application.

Listing of Claims:

1. (Currently amended) A distributed data processing system employing negotiation ~~among autonomous agents~~ for allocation of resources, said system and comprising:

a communications network for passing messages ~~between computers connected thereto;~~

a plurality of computers connected to said communication network for running programs, said plurality of computers thereon including a at least first autonomous agent computer and a second autonomous agent computer agents;

said first agent computer having a first graph representing resources required for tasks performed by said first agent computer, said second agent computer having a second graph representing resources required for tasks performed by said second agent computer, each said agent receives a graph associated therewith and wherein the graph represents for the associated agent what resources that agent has and what task or tasks that agent may perform and each said agent employs the associated said graph to determine what resource or resources are needed by that agent to carry out the task or tasks to be performed by that agent, and,

said first agent computer negotiating with said second agent computer for resources required to perform tasks by said first agent computer, said second agent computer negotiating with said first agent computer for resources

required to perform tasks by said second agent computer, said
~~agents negotiate with each other for the resources needed to~~
~~carry out the task or tasks to be performed by said agents.~~

said first agent computer calculating deadlock
avoidance structures relating to an internal representation of
initialization data and said first graph.

2. (Currently amended) A system as set forth in claim 1
wherein ~~each~~ said first agent computer ~~additionally~~ receives
initialization data relating to ~~the associated~~ said first
graph.

3. (Currently amended) A system as set forth in claim 2
wherein ~~each~~ said first agent computer determines whether the
~~said~~ initialization data has been received.

4. (Currently amended) A system as set forth in claim 3
wherein, if the initialization data has been received, if the
~~determination is affirmative, then the~~ said first agent
computer provides ~~sets up~~ an internal representation of
~~respecting~~ the initialization data.

5. (Canceled)

6. (Currently amended) A system as set forth in claim 4
wherein ~~each~~ said first agent computer receives cost data
~~representing cost~~ and task completion reward data. ~~rewards.~~

7. (Currently amended) A system as set forth in claim 6 wherein ~~each~~ said first agent computer determines whether the ~~said~~ cost data has been received.

8. (Currently amended) A system as set forth in claim 7 wherein ~~each~~ said first agent computer forwards update data to a central authority computer, the update data representing and ~~wherein said update data represents~~ local connections and dependencies.

9. (Currently amended) A system as set forth in claim 8 wherein ~~each~~ said first agent computer ~~additionally~~ forwards additional update data to said central authority computer, the additional update data including ~~wherein said additional~~ ~~update data also includes~~ data representing remaining resources and task status.

10. (Currently amended) A system as set forth in claim 9 wherein ~~each~~ said first agent computer calculates desired output offer costs.

11. (Currently amended) A system as set forth in claim 10 wherein ~~each~~ said first agent computer forwards outgoing offers of resources to said second agent computer. ~~other agent or agents.~~

12. (Currently amended) A system as set forth in claim 11 wherein said first ~~each~~ agent computer determines whether ~~any~~ additional ~~resource~~ ~~or~~ resources are needed for task completion by said first ~~that~~ agent computer.

13. (Currently amended) A system as set forth in claim 12 wherein said first ~~each~~ agent computer calculates desired resource bid cost if ~~any~~ additional ~~resource~~ ~~or~~ resources are needed.

14. (Currently amended) A system as set forth in claim 13 wherein ~~each~~ said first agent computer forwards outgoing bids for resources to said second agent computer. ~~the other agent or agents.~~

15. (Currently amended) A system as set forth in claim 14 wherein ~~each~~ said first agent computer receives incoming offers of resources from said second agent computer. ~~the other agent or agents.~~

16. (Currently amended) A system as set forth in claim 15 wherein ~~each~~ said first agent computer receives data representing incoming bids from said second agent computer, said second agent computer ~~the other agent or agents~~ seeking additional ~~resource~~ ~~or~~ resources.

17. (Currently amended) A system as set forth in claim 16 wherein ~~each~~ said first agent computer determines whether ~~there are any acceptable offers or bids~~ from said second agent computer are acceptable. ~~the other agent or agents.~~

18. (Currently amended) A system as set forth in claim 17 wherein ~~each~~ said first agent computer provides making an affirmative determination of an offer, said first agent computer forwarding ~~respecting acceptable offers or bids and forwards~~ an outgoing acceptance.

19. (Currently amended) A system as set forth in claim 17 wherein said first ~~each~~ agent computer ~~that determines that there are no acceptable offers or bids~~ receives an incoming acceptance ~~acceptances~~ from said second agent computer. ~~the other agent or agents.~~

20. (Currently amended) A system as set forth in claim 19 wherein said first ~~each~~ agent computer determines whether additional ~~if any more~~ resources are required for task completion by said first agent computer. ~~that agent.~~

21. (Currently amended) A system as set forth in claim 20 wherein said first ~~each~~ agent computer ~~that~~ no longer needs resources, said first agent computer searching said first graph ~~searches the associated graph~~ for a path for task completion, said first agent computer completing the ~~and then completes that task.~~

22. (Currently amended) A method ~~operative in a distributed data processing system employing negotiation among autonomous agents~~ for allocation of resources, said method comprising the steps of: and

employing a communications network for passing messages between a first agent computer and a second agent computer;

executing programs by a central authority computer, the first agent computer, and the second agent computer;
~~computers connected thereto and wherein said computers are operative to run programs thereon including a central authority and at least first and second autonomous agents comprising the steps of: each said agent~~

receiving a first graph by the first agent computer, the first graph representing a first set of tasks and resources utilized by the first set of tasks;

receiving a second graph by the second agent computer, the second graph representing a second set of tasks and resources utilized by the second set of tasks; graph
~~associated therewith and representing for that agent what resources that agent has and what task or tasks that agent may use the resources for;~~

utilizing the first graph for determining resources required by the first agent computer to perform the first set of tasks;

utilizing the second graph for determining resources required by the second agent computer to perform the second set of tasks; each said agent employing the associated said

~~graph for determining what resource or resources are needed by that agent to carry out the task or tasks to be performed by that agent; and,~~

negotiating between the first agent computer and the second agent computer for resources requires to perform the first and second sets of tasks; and ~~said agents negotiating with each other for the resources needed to carry out the task or tasks to be performed by said agents.~~

calculating deadlock avoidance structures based on an internal representation of initialization data.

23. (Currently amended) A method as set forth in claim 22 further including the step of ~~wherein the step of receiving a said associated graph includes the step at each agent of~~ receiving initialization data relating to the first ~~associated~~ said graph.

24. (Currently amended) A method as set forth in claim 23 further including the steps ~~step~~ of determining whether if ~~said~~ initialization data has been received and ~~if so~~ setting up a ~~an internal~~ representation based on the ~~said~~ initialization data.

25. (Currently amended) A method as set forth in claim 24 wherein the ~~said~~ representation is an internal ~~PN~~ representation.

26. (Canceled)

27. (Currently amended) A method as set forth in claim 24 further including the steps ~~step~~ of receiving cost data, ~~and~~ determining whether the cost data has been received, and ~~if so then~~ forwarding updated data to the ~~a~~ central authority computer, the ~~with said~~ updated data ~~including data~~ representing local connections and dependencies.

28. (Currently amended) A method as set forth in claim 27 wherein the ~~said step of forwarding said~~ updated data includes ~~additional updated~~ data representing ~~the~~ remaining resources and task status.

29. (Currently amended) A method as set forth in claim 28 further including the steps ~~step at each agency~~ of calculating ~~the~~ desired output offer cost and forwarding outgoing offers to the first and second agent computers. ~~other agent or agents.~~

30. (Currently amended) A method as set forth in claim 29 further including the steps ~~at each agent~~ of determining whether ~~any~~ additional resources are needed to complete a ~~the~~ task by the first agent computer ~~that agent~~ and ~~f-so~~ calculating desired resource bid costs.

31. (Currently amended) A method as set forth in claim 30 further including the step of forwarding outgoing bids for resources to the second agent computer. ~~other agent or agents.~~

32. (Currently amended) A method as set forth in claim 31 further including the steps ~~at each agent~~ of receiving incoming offers of resources, receiving and bids seeking additional resources from the second agent computer, ~~other agent or agents~~ and ~~then~~ determining ~~at each agent~~ whether ~~any~~ acceptable ~~offers or~~ bids have been received.

33. (Currently amended) A method as set forth in claim 32 further including the step ~~at each agent~~ of forwarding outgoing acceptances ~~if the determination of whether any~~ acceptable ~~offers or~~ bids ~~is affirmative~~.

34. (Currently amended) A method as set forth in claim 31 further including the step ~~at each agent~~ of determining whether ~~any~~ more resources are required by the first agent computer. ~~needed.~~

35. (Currently amended) A method as set forth in claim 34 wherein the first each agent computer searches the first associated graph for a path for task completion path, the first agent computer completing ~~and then completes~~ the task.

36. (Currently amended) A computer program product stored in a computer readable medium, said product being operative in a distributed data processing system employing negotiation among autonomous agents for allocation of resources, the system including wherein the system includes a communications network, said product including: for passing messages between computers connected thereto and wherein said computers are connected to said network for running programs thereon including at least two autonomous agents, and comprising:

a first autonomous agent node receiving first and second autonomous agents, each said agent receives a first graph representing a first set of associated therewith and wherein the graph represents for the associated agent what resources that agent has and what task or tasks and resources for performing the first set of tasks, the first agent node utilizing the first graph to determine the resources required for performing the first set of tasks; that agent may use the,

a second autonomous agent node receiving a second graph representing a second set of tasks and resources for performing the second set of tasks, the second agent node utilizing the second graph to determine the resources required for performing the second set of tasks; each said agent employs the associated said graph to determine what resource or resources are needed by that agent to carry out the task or tasks to be performed by that agent, and,

the first agent node negotiating with the second agent node for resources required to perform the first set of

~~tasks, said agents negotiate with each other for the resources needed to carry out the task or tasks to be performed by said agents.~~

the first agent node calculating deadlock avoidance structures relating to an internal representation of initialization data and the first graph.

37. (Currently amended) A system as set forth in claim 36 wherein the first agent node ~~each said agent~~ additionally receives initialization data relating to the first ~~associated~~ ~~said~~ graph.

38. (Currently amended) A system as set forth in claim 37 wherein the first agent node ~~each said agent~~ determines whether the ~~said~~ initialization data has been received by the ~~first agent node~~.

39. (Currently amended) A system as set forth in claim 38 wherein the first agent node ~~if the determination is affirmative, then the agent~~ sets up an internal representation of ~~respecting~~ the initialization data.

40. (Canceled)

41. (Currently amended) A system as set forth in claim 39 wherein the first agent node ~~each said agent~~ receives ~~cost~~ data representing task completion costs ~~cost~~ and task completion rewards.

42. (Currently amended) A system as set forth in claim 41 wherein the first agent node ~~each said agent~~ determines whether the task completion costs have ~~said cost data has been~~ received.

43. (Currently amended) A system as set forth in claim 42 wherein the first agent node ~~each said agent~~ forwards update data to a central authority node for maintaining update data, the update data representing ~~and wherein said update data represents~~ local connections and dependencies.

44. (Currently amended) A system as set forth in claim 43 wherein the first agent node ~~each said agent~~ additionally forwards additional update data to the ~~said~~ central authority node, the additional update data including ~~wherein said additional update data also includes data representing~~ remaining resources and task status.

45. (Currently amended) A system as set forth in claim 44 wherein the first agent node ~~each said agent~~ calculates a desired output offer cost. ~~costs.~~

46. (Currently amended) A system as set forth in claim 45 wherein the first agent node ~~each said agent~~ forwards outgoing offers of resources to the second agent node. ~~other agent or agents.~~

47. (Currently amended) A system as set forth in claim 46 wherein the first agent node ~~each agent~~ determines whether any additional ~~resource or~~ resources are required for completion of the first set of tasks. ~~needed for task completion by that agent.~~

48. (Currently amended) A system as set forth in claim 47 wherein the first agent node ~~each agent~~ calculates a desired resource bid cost ~~if any additional resource or resources are needed.~~

49. (Currently amended) A system as set forth in claim 48 wherein the first agent node ~~each said agent~~ forwards outgoing bids for resources to the second agent node. ~~other agent or agents.~~

50. (Currently amended) A system as set forth in claim 49 wherein the first agent node ~~each said agent~~ receives an incoming offer ~~offers~~ of resources from the second agent node. ~~other agent or agents.~~

51. (Currently amended) A system as set forth in claim 50 wherein the first agent node ~~each said agent~~ receives data representing incoming bids from the second agent node ~~other agent or agents seeking additional resource or resources.~~

52. (Currently amended) A system as set forth in claim 51 wherein the first agent node ~~each said agent~~ determines whether there are any acceptable ~~offers or~~ bids from the second agent node. ~~other agent or agents.~~

53. (Currently amended) A system as set forth in claim 52 wherein the first agent node affirmatively determines ~~each said agent making an affirmative determination respecting~~ acceptable ~~offers or~~ bids and forwards an outgoing acceptance.

54. (Currently amended) A system as set forth in claim 53 wherein the first agent node ~~each agent that~~ determines ~~that there are no acceptable offers or bids and then~~ receives incoming acceptances from the second agent node. ~~other agent or agents.~~

55. (Currently amended) A system as set forth in claim 54 wherein the first agent node ~~each agent~~ determines whether ~~if any~~ more resources are required for task completion by the first agent node. ~~that agent.~~

56. (Currently amended) A system as set forth in claim 55 wherein the first agent node ~~each agent that no longer needs resources~~ searches the first associated graph for a path for task completion ~~and then completes that task.~~